CONNECTION BETWEEN A SIDE RAIL AND A STRUCTURAL PART OF THE FRONT OF A MOTOR VEHICLE

The present invention relates to a connection between a side rail and a structural part of the front of a motor vehicle.

BACKGROUND OF THE INVENTION

The top cross-member of a cooling unit or of an equipment front face is generally installed in such a manner as to present a hard point when subjected to an impact against the head or the hip of a pedestrian.

Such rigidity makes such a top cross-member dangerous for pedestrians in the event of an impact against the head or the hip since no energy-absorbing stroke is available. On the contrary, the cross-member is dimensioned to withstand a force of up to 3000newtons (N) over the entire width of the vehicle. Thus, the cross-member contributes directly to ensuring that the structure of the vehicle is rigid.

SUMMARY OF THE INVENTION

One of the objects of the present invention is to propose a remedy to the danger that a top cross-member presents for pedestrians, and more generally the danger presented by the rigid top edge of any structural part at the front of a motor vehicle.

The present invention provides a connection between a side rail and a structural part at the front of a motor vehicle, the structural part having a top edge situated in the vicinity of a zone of the bodywork that might receive an impact from the head or the hip of a pedestrian. The connection comprises force-opposing means enabling the side rail to oppose the vertical forces to which the part is subjected, and said means are collapsible.

The term "collapsible" is used to mean that the force-opposing means can retract, become deactivated, or be destroyed, so that in each case the result is that vertical forces are no longer opposed.

By means of the invention, an impact against a pedestrian in the vicinity of the rigid top edge of the part causes either the part to move downwards if it is not connected to any other point of the vehicle after being released vertically relative to the side rail, or else causes the part to bend and/or rupture together with its other points of connection to the vehicle.

In particular, regardless of whether the part moves down or bends, it is advantageous for it not to provide any hard point over a height of 50millimeters (mm) below the front of the hood, so as to avoid disturbing the hood acting to absorb energy from the head or the hip of the pedestrian.

The invention presents other advantageous characteristics that can be taken in isolation or in combination:

- the force-opposing means are constituted by a finger mounted on each side rail to move under drive from an actuator between an extended position in which the finger retains the part vertically, and a retracted position in which the part is released;

- the actuator is a motor;

- the actuator is connected to an impact sensor, preferably a sensor suitable for distinguishing between contact with a pedestrian and contact with an obstacle other than a pedestrian;

- the force-opposing means are constituted by a fixed finger that is breakable above a predetermined vertical force threshold to which the part is subjected;

- the force-opposing means comprise a fusible portion of the part;

- the force-opposing means are constituted by an insert embedded in the part and fixed to the side rail, said insert being configured to split the part beyond a predetermined threshold of vertical force to which said part is subjected;

- the part carries an electrical hood lock which is caused to open by a sensor that has detected contact with a pedestrian;

- the ends of the part lie under fender linings of the vehicle and are secured thereto by fusible fasteners, e.g. overmolded or crimped inserts;

- the part is a cooling unit; and

- the part is an equipment front face.

BRIEF DESCRIPTION OF THE DRAWINGS

To facilitate understanding the invention, there follows a description of two embodiments given with reference to the accompanying drawings, in which:

- Figure 1 shows one end of the side rail carrying an impact beam;

- Figure 2 is a view analogous to Figure 1 after an equipment front face has been mounted on the side rail;

- Figure 3 shows the same parts seen from beneath; ~~and~~

- Figure 4 is a detail view at location IV of Figure 2, showing another embodiment,

- Figure 5 is a detail view at location IV of Figure 2, showing another embodiment, and

- Figure 6 is a VI-VI section view of the end of the top cross member of the equipment front face of Figure 3.

DETAILED DESCRIPTION OF THE INVENTION

Figure 1 shows a connection plate 1 at the end of a side rail 2. The connection plate 1 carries a motor-driven moving finger 3 which projects from the front face of said plate.

In conventional manner, the connection plate 1 also supports an impact beam 4.

In Figure 2, there can be seen an equipment front face 5 comprising a horizontal top cross-member 5' and two vertical uprights 6 (only one of which is visible in the figure), the uprights being designed to press against the plates.

The equipment front face 5 forms a structural part of the front of the vehicle, and is designed to oppose forces generated by the hood and by vehicle vibration.

Optionally, the structural part includes a cooling unit 24, as shown in figure 2.

The equipment front face 5 is connected to the vehicle via connections designed so as to be capable of opposing forces and bending torque along any axis other that the vertical axis. In the normal configuration, vertical forces are fully opposed by the moving fingers 3 on the two side rails 2.

In addition, a sensor 14 ~~(not shown)~~ suitable for distinguishing between contact with a leg and contact with some other type of obstacle provides detection information for triggering the motor 12 of each finger 3 in the event of a pedestrian being detected. The motor 12 acts as an actuator 12 for the finger.

Optionally, the equipment front face 5 carries an electrical hood lock 18 which is caused to open by the sensor 14 that has detected contact with a pedestrian.

When the motor is actuated, the finger 3 is withdrawn so as to become flush with the front face of the connection plate, thereby releasing the upright 6 of the equipment

front face 5 in the vertical direction. The equipment front face 5 can thus move downwards relative to the side rail if it is not connected to any other point of the vehicle, or else it can be suspended from the fender liners 7, as shown in Figure 3.

The end 22 of the top cross-member 5' of the front face 5, secured to the fender lining 7, passes beneath ~~it~~ the bottom 20 of the fender lining 7 and is secured thereto by fusible rivets 8, e.g. made of plastics material, and by inserts 30 as shown in Figure 6, for example, overmolded or crimped inserts 30.

If the force imparted by the head of a pedestrian against the top cross-member 5' is large, then the rivets 8 break and the top cross-member moves downwards, thereby enabling the energy of the impact to be absorbed by the hood.

In the example of Figure 4, the uptight 6' of the front face 5 has slots ~~(not shown)~~ 15 in a region 9 about a connection eyelet 10. The eyelet is designed to receive a bolt (not shown) for fastening the equipment front face to the plate 1 of the side rail. Each slot 15 forms a fusible portion of the uptight 6'.

In the event of a vertical force being imparted to the equipment front face 5 above a certain threshold, the slots, which constitute rupture starters, propagate along the upright which then moves down past the bolt.

The threshold force is determined by the configuration of the slots to lie in the range 3000N to 4000N, so that the front face can withstand the stresses applied to its top cross-member under normal conditions of use of the vehicle, but moves downwards in the event of an impact against a head or a hip.

To split the upright, it is possible to provide an insert ~~(not shown)~~ 16 in the form of a wedge disposed around the connection eyelet 10, as shown in figure 5.

The examples described above are not limiting in any way.